Northeastern Forest Experiment Station

Upper Darby, Pa.

QUARTERLY REPORT ON

FOREST INFLUENCES AND FLOCD CONTROL SURVEYS

July 1, 1952

FLOOD CONTROL SURVEYS

by Norman R. Tripp

STATUS OF FLOOD CONTROL SURVEY REPORTS

Connecticut River.--In Secretary's Office.

Merrimack River.--Step 2 draft completed in manuscript.

Salt River.--Step 8 draft in process.

Allegheny River.--First draft in process.

Upper Susquehanna and Monongahela Rivers.-- No further progress.

Potomac River (ReviewReport).--Planned field work completed--further work awaiting additional funds.

NE-NYIAC--Resources Survey.--Still plugging along. No change in target date of February 1953.

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Further Discussion -

We would like to begin by thanking Maevers for his contribution to the discussion. Particularly so because he has expressed so succinctly the point of view of a considerable number of people in the Department--the very point of view which we believe is much too restrictive and with which we are taking issue.

This point of view says that those of us who are in opposition misunderstand the objective of flood control. The difference of opinion is not

in understanding of the objective--that, of course, is to reduce flood damage--but rather in definition of the word "flood." What is this flood we are trying to control? Does it occur only on permanent streams? According to Webster a flood is -

> A great flow of water.
> A body of moving water.
> A deluge.

The American College Dictionary says a flood is -

> A great flowing or overflowing of water, especially over land not usually submerged.

There is nothing in any of these definitions which confines flooding to the proximity of rivers and streams.

The 1936 Flood Control Act, Section I (from which Maevers quotes) sets up Federal policy. Section II of the same Act which sets up procedure and delimits responsibilities says -

> That hereafter Federal investigations and improvements of RIVERS and other waterways for flood control and allied purposes shall be under the jurisdiction of and shall be prosecuted by the War Department ..... and Federal investigation of WATERSHEDS and measures for RUN-OFF AND WATERFLOW RETARDATION AND SOIL EROSION PREVENTION ON WATERSHEDS shall be under the jurisdiction of and shall be prosecuted by the Department of Agriculture.....

There is certainly nothing here that limits us to consideration only of flooding by high stream stages.

Recently we investigated a flash flood on a small stream in Vermont. We found that, after an unusually heavy rain, water seeping through the ground or running over the surface down a steep mountain side had been collected by an old wood-hauling road. After running down the wood road for half a mile the water had turned onto a main highway. The highway was gutted out for nearly a mile before the water turned off into a small stream channel which parallels the highway. Further down the water had jumped over into the highway and again washed out a considerable length before returning to its channel. By Maevers definition, only that portion of the damage caused by water from the stream would be classed as flood damage--the damage above is no concern of ours because the water had never run in a normal geologic watercourse. Suppose that if instead of entering the stream the water had turned off the highway in the other direction, carrying its load of water and debris onto some farmer's field and ended there--by definition no flood,

no flood damage--we wouldn't even attempt to devise a program.

To us this seems a ridiculously narrow point of view and one which we have apparently brought on ourselves since we can find no mandate for such limitation. The flood we would prefer to control is "any unusual or unnatural damaging flow of water wherever it may occur." Any damage resulting from such a flow we would consider "flood damage."

We in Agriculture are charged with the protection and management of the soil resource to the end that it may continue to yield products beneficial to mankind without itself being deteriorated. Water is both a beneficial product and a deteriorating agent. From the land manager's point of view the mandate from Congress which charges the Department with responsibility only for waterflow RETARDATION instead of for waterflow REGULATION is sufficiently unfortunate in its limitation. Carrying functionalization to the point where one group is charged with developing plans for retarding the flow of water, while another group plans for improving the flows in the same area is bad enough. Further specialization, which would charge Flood Control with responsibility for retarding only that part of the flow which will cause damage within the narrow limits of a stream channel, piles absurdity upon absurdity.

Why should we force ourselves into specialization? Why should we limit ourselves to designing programs to deal only with the thousands of dollars in damages along our rivers when damage from runaway water over the land runs into the millions?

If our attitude is a hang-over from the traditional flood control programs as carried out by the Corps of Engineers, it is time we took a fresh look at our own responsibilities.

If this attitude comes as a reflection of present thinking in the Congress it is high time the true facts are presented to them in proper perspective.

Our job is to conserve the land and water resource. If we can pick up some incidental benefits along the rivers, all the better, but let's don't get the cart before the horse.

FOREST INFLUENCES

DELAWARE BASIN RESEARCH CENTER

by Irvin C. Reigner

General

The highest annual rainfall since the beginning of measurements at the Dilldown Watershed, a record of 60 inches set last hydrologic year, probably will be broken this current year. By the end of May, over 50 inches of precipitation had fallen over the watershed, as compared with less than 44 inches during the same period in the record year of 1950-51.

With four more months in this hydrologic year still to be accounted for, total rainfall should easily exceed 60 inches.

Even with this exceptionally high rainfall, over 10 inches in April and almost 7 inches in May, one of the worst spring fire seasons on record was experienced in the Dilldown area. This was due mainly to poor distribution of rainfall during the most critical period. No rain fell from April 24 to May 10, during which period temperatures were high, humidities low, and the vegetation not yet in leaf.

Fortunately, the watershed excaped burning, although it took fast, efficient control by Gene McNamara and his associates on May 8 and 9 to put out two incendiaries in the adjacent drainage.

Soil Moisture Studies

Charley Carlson of the Southern Station, now on detail to the Vicksburg Infiltration Project, visited the Research Center in May to review our soil moisture studies. From previous contacts between the Center and the Vicksburg Infiltration Project, the latter found a need for the Delaware Basin soil moisture measurements, tabulations, and calculations to date. As these calculations were not complete throughout the periods designated by the Vicksburg Infiltration Project, and as the desired form of the tabulations was somewhat different from our form, considerable clerical work was necessitated to complete and transcribe the data.

Ultrawet and Krilium Tests

Bethlahmy and Reigner assisted Dr. W. E. McQuilkin of the Anthracite Research Center in the establishment of plots testing these two soil conditioners. The plots are located on strip mine spoil banks in the vicinity of Wilkes-Barre.

The ultrawet study, which was established about the beginning of May, tests the effect of the chemical on the direct seeding of red pine. These

plots are on generally level ground and additional plots were established on steep slopes which were treated with the chemical and then seeded with a grass mixture.

Krilium, which was not delivered until June, was used to treat seedlings planted earlier this season. The trees were treated individually and at random, causing plots to vary considerably in size. The effect of krilium on survival and growth will be noted during the next two years.

As in the ultrawet study, krilium was applied to plots on steep slopes to determine any effect on decreasing erosion on loose, unconsolidated material at these steep slopes.

Ned Bethlahmy will later test the effect of both soil conditioners on increasing infiltration. However, the difficulty in measuring infiltration on slopes of 45 degrees or more appears to be considerable.

Scrub Oak Conversion

Continuing the search for the best adapted species to be planted on scrub oak lands and the most efficient techniques to establish them, several small interrelated studies were begun this spring. Two hardwood species not previously tested, tulip poplar and black cherry, were planted. High quality red oak acorns were seeded by two methods, directly into the native soil and in cardboard cartridges containing a more fertile soil.

In conjunction with the new species tests, openings were prepared in the brush by poisoning in which the young plants might grow without competition. The most promising of the coniferous species were planted in these poisoned spots in addition to the above species. Similar plantings were made in adjacent untreated plots to serve as a control on the site treatment. The new species were also planted under the various methods of mechanical site preparation tried previously.

Another related study was begun to test more fully the effect of various herbicides and different concentrations of each on scrub oak brush. Plots were established on the fire lines surrounding the experimental forest to study these variables and larger stretches of fire line were treated with a high concentrate poison to determine costs of controlling brush on fire breaks.

All studies were undertaken jointly by the Northeastern Station and the Pennsylvania Department of Forests and Waters.

Interception

All previous installations at Dilldown and at the Pocono Experimental Forest measuring thrufall and stemflow were reactivated this spring. One new stemflow installation--on rhododendron within the high forest stemflow area at

Dilldown and beneath the overstory--is in the process of establishment. Certain improvements in the old installations have been made including the replacement of some of the stemflow collector cans with much larger containers. A fifty-five gallon oil drum has been installed at each of two nine-inch beeches, while two eight-inch red maples and a six-inch ash each required twenty-five gallon collectors. These capacities are necessary to collect the stemflow from a two-inch rainfall and we hope to avoid overflows this season.

Advisory Council Meeting

Split Rock Lodge in the Poconos was the locale of the annual meeting of the Northeastern Forest Research Advisory Council. Held Friday and Saturday, June 13 and 14, the meeting was well attended by members and guests from industries, state forestry services, schools, and the Federal Service.

Following opening remarks by Chairman Paul Koenig, members of the Station Staff discussed present research activities in the Northeast and special problems of the Experiment Station program. Regional Forester Swingler spoke on the Timber Resource Review and Fred Simmons discussed findings of the Equipment Manpower Survey. Dr. E. C. Crafts, Assistant Chief from the Washington Office, brought the group up to date on the latest Forest and Range Legislation before Congress.

Marinus Westveld spoke on evaluating forest site quality by the use of plant indicators and soil survey data. Dr. Bill Bramble discussed plans for research in oak wilt in Pennsylvania.

A movie prepared by the Interstate Commission on the Delaware concerning its program to utilize the water resources of the Delaware Basin was shown Friday evening. A highlight of the meeting was the flash announcement by Dr. Crafts of Mr. Swingler's promotion to Assistant Chief of the Forest Service.

Saturday morning, the group journeyed to the Delaware-Lehigh Experimental Forest. Storey and Reigner explained the major phases of the Dilldown Watershed project as the various points of interest were visited, while Dr. McQuilkin told the group about the scrub oak conversion program.

Personnel

Ned Bethlahmy has been on leave most of June increasing his considerable knowledge on forest soils. Ned is attending a forest soils seminar being given by Dr. Coile at Duke University.

Harry Price, our versatile clerk, accepted a transfer to the Southern Station during the quarter. He is now located at the Gulfcoast Research Center, Gulfport, Mississippi. We were not happy about Harry's departure, as he had been with us since the establishment of this Center and was very capable. However, he has been ably replaced by Miss Ann Coachys of Bethlehem. Besides having the ability to learn our varied and sometimes complicated routine in

short order, Ann helps considerably to brighten an otherwise drab office.

Ed Read and Ernest Kurmes, students at Lehigh University, have been hired to help with the soil moisture tabulations. Following the completion of this work, Ed will be our summer field assistant.

Visitors

Dr. Marquis spent two days with us in May going over the influences work at Dilldown and at the Pocono Experimental Forest. This Center has the distinction of being the first to get our Director stuck in the mud, then adding insult to injury by splattering him with mud from head to toe.

Dick Trimble of the Mountain State Research Center spent most of one week here observing our soil moisture procedures in detail.

Spence Potter, who is now engaged in analyzing frost data in Upper Darby, was given a look at the field installation in the vicinity of the Pocono Experimental Forest by Ned Bethlahmy.

Hal Wilm and Walt Zillgitt of the Washington Office paid a brief visit to the Delaware-Lehigh Forest during their inspection of the Station. While at the fire tower we gave them a taste of thunder, lightning, cloudburst and heavy wind.

MOUNTAIN STATE RESEARCH CENTER

by the Mountain State Staff

Rain Gage Pattern

We began our watershed study on May 1, 1951, using 15 standard rain gages on the five watersheds--approximately 26 acres per gage. At the end of one year of operation we have reduced the number to 10. Working with alternate Horton-Thiessen areas we found that the differences in watershed precipitation using measurements from 10 gages as compared to 15 were negligible. The comparisons were made both on a basis of monthly precipitation and on a basis of storms over .5" of rain.

Runoff as a Percent of Rainfall

The following table shows by months what percent of the precipitation ran off our watersheds during the growing season of 1951.

Month	Watersheds				
	#1	#2	#3	#4	#5
May	46.90	59.55	57.46	51.31	No record
June	34.63	41.07	39.38	40.26	No record
July	17.43	22.36	28.43	25.89	24.81
August	1.00	3.00	3.11	1.54	3.26
September	.32	.98	1.57	.65	2.34
October	.49	1.40	1.41	.05	1.48

Canopy Effects on Precipitation

During the dormant season of 1951 and 1952 we studied the effect of a fully-stocked hardwood canopy (without leaves) in reducing the amount and intensity of ground rainfall.

Five recording rain gages were placed at random in an area of 50-year old hardwoods. Elevation, aspect, and slope position were similar for all gages. The control consisted of a recording gage in a 1/2 acre cleared plot within 100 yards of any canopy gage and similarly located with respect to elevation, aspect, and slope position.

Three comparisons were made between the measurements recorded at the open and canopy gages: (1) The amount of rainfall or throughfall, (2) maximum 5-minute intensities, (3) maximum 15-minute intensities.

Throughfall

The average difference, based on 33 storms, between ground rainfall in the open and under canopy was highly significant. t = 8.1161. The storms varied in amount of rainfall from .04" to approximately 1.50". The data plotted as a straight line, i.e. ground rainfall under canopy plotted over ground rainfall in the open. The following regression equation was determined to estimate ground rainfall under a canopy from that in the open:

$$Y = -0.00618 + 0.789x$$

Where Y = rainfall under canopy and x = rainfall in the open.

Using this equation the proportion of rainfall to reach the ground for several storms of different sizes is given below:

Open Rainfall (inches)	Throughfall as a percent of rainfall (percent)
.10	73
.50	78
1.00	78
2.00	79
4.00	79

The differences between catches in the several gages under canopy were relatively small. Standard deviations from the average throughfall for any one storm were generally less than five percent.

Intensities

The differences in intensities in the open and under canopy were highly significant for both 5-minute maximum and 15-minute maximum intensities. As would be expected, intensities under canopy were less than open rainfall intensities. Averaging all storm data, the effect of canopy is to reduce 5-minute maximum intensities by 19 percent and 15-minute maximum intensities by 15 percent.

As in the case of throughfall, standard deviations from the canopy average for any one storm were generally very small.

This study is being continued through the summer to test the effect of the same canopy when the leaves are out. We expect to have a full report ready in the fall of 1952.